REMARKS

The foregoing amendment amends claim 9 to clarify certain limitations in the claim. Pending in the application are claims 9-14, of which claim 9 is independent. The following comments address all stated grounds for rejection and place the presently pending claims, as identified above, in condition for allowance.

The Claimed Invention

The present invention is directed to a fuel cell stack comprising a fuel cell stack which comprises a fuel cell unit composed of a solid polymer ion exchange membrane interposed between an anode electrode and a cathode electrode, and separators for supporting the fuel cell unit interposed therebetween. The fuel cell units and the separators are stacked in the horizontal direction.

The fuel cell stack includes an inlet side communication hole, which penetrates through the separators, for supplying a reaction gas. The fuel stack further includes an outlet side communication hole for discharging a reacted gas, which corresponds to the reaction gas, and a discharge hole provided at a deep portion of an outlet side communication hole opposite a discharge port. The discharge hole supplies the reaction gas to the outlet side communication hole. As shown in Figure 19, in one embodiment, a portion of the reaction gas, which is supplied to the inlet side communication hole, passes from an inlet hole of the bypass plate 202, through a bypass flow passage in the bypass plate, and is ejected at the discharge hole to the outlet side communication hole.

The fuel cell stack of the present invention allows for smooth and reliable discharge of water, the byproduct of the reaction. The components of the fuel cell are arranged such that product water, which is retained at the deep portion of the outlet side oxygen-containing gas communication hole 38b is extruded toward the discharge port H.

35 U.S.C. 112 Rejections

Regarding the rejection of claims 9-14 under 35 U.S.C. 112, second paragraph, Applicants submit that the claims are clear and definite.

As set forth in the application and Figures, the "outlet side communication holes" are denoted by the reference numerals 36b and 38b. The communication holes are conduits that extend through the separator to convey a liquid or gas through the fuel cell stack. The "outlet side communication holes" are used to discharge a liquid or gas from the fuel cell stack.

The term "discharge hole" is denoted by the reference numeral 204 in the figures and throughout the application, in particular, in Figure 19 and on page 27, lines 6-12 of the specification. As set forth, the discharge hole 204 may be provided in a bypass plate 202 arranged in tight contact with a surface of the first separator of the fuel cell stack. The discharge hole is used to supply oxygen-containing reaction gas to be used for the fuel cell reaction to the outlet communication hole 38b.

The term "port" refers to an entrance or exit of a communication hole and is denoted by the reference numerals K, H (in Figure 19). For example, the reference "K" denotes the supply port (entrance) of the inlet side of the oxygen-containing gas communication hole 38a and the reference "H" denotes the discharge port (exit) for the outlet side oxygen-containing gas communication hole 38b. While the terms "port" and "hole" may be synonymous, the term "port" as set forth in the present invention comprises a *portion* of a communication hole for providing access between the interior of the corresponding communication hole and the exterior of the fuel cell.

The term "inlet hole" is denoted by the reference numeral 206. The inlet hole 206 may be provided in a bypass plate to supply a part of the oxygen-containing gas to the inlet side oxygen-containing gas communication hole 38a.

The term "deep portion" refers to a portion of the outlet side communication hole at the upstream end of the fuel cell stack in the flowing direction. Applicants submit that the term is sufficiently defined throughout the specification, for example on page 26, line 19 through page 27, line 2 and on page 29, lines 6-13. As shown and described, the

"deep portion" of a communication hole refers to a portion of the communication holes that is opposite the inlet and/or outlet port (K, H) of the communication hole.

Applicants respectfully submit that the terms are clear and definite and respectfully request that the rejection of claims 9-14 under 35 §U.S.C. 112 be withdrawn.

35 U.S.C. 102 Rejections

Applicants thank the Examiner for the close review of the claims. In the Office Action, the Examiner rejects claims 9, 10 and 14 under 35 U.S.C. §102(e) as being unpatentable over Guthrie (U.S. Patent Number 6,403,247). Applicants respectfully traverse the rejection and submit that the claims are patentable over the cited prior art.

The Guthrie reference is directed to a manifold system for a fuel cell power plant. The manifold system includes an inner separator baffle to bifurcate the inlet and exhaust manifold into separate plenums, which is gas impermeable to ensure that input and exhaust fuel flows are separated. In operation, the fuel is provided to the manifold via a fuel inlet and is separated by the inner separator baffle and diverted into a first half of each of the fuel cell stacks. A fuel turn manifold redirects the fuel to the second half of the fuel cell stacks and the circulated fuel is then exhausted. As shown in Figure 4 of the Guthrie reference, a fresh fuel gas flows in a direction substantially perpendicular to the fuel exhaust tube 112 and then flows into the fuel exhaust tube 112, unlike the claimed invention. In Guthrie, the flow of the fuel gas does not function to discharge water in the fuel exhaust tube toward the outlet side, as required by the claimed invention.

Furthermore, while the fuel cells in Guthrie, are electrically joined together, the fuel cells are not *horizontally stacked*, as required by the claimed invention. The fuel cells in Guthrie share a fuel inlet and exhaust manifold, but are bifurcated into separate plenums, rather than being stacked together.

The Guthrie device does not include an inlet side communication hole that penetrates through the separators of the fuel cell units, as required by claim 9. Rather,

Guthrie device includes a fuel inlet 110 that divides into separate channels to separately direct fuel into each of the fuel cells 102, 104.

The Guthrie device also does not include a discharge port provided at a deep portion of an outlet communication hole for providing a reaction gas, as required by claim 9.

The Guthrie reference further does not teach or suggest a bypass flow passage at a deep portion of the inlet and outlet side communication holes for connecting the deep portions of the inlet and outlet side communication holes to form a return flow structure, as required by claim 11.

The Guthrie device further does not teach or suggest that the number of flow passages communicating with the inlet side communication hole is larger than the number of flow passages communicating with the outlet side communication hole, as required by claim 12.

The Guthrie device also does not teach or suggest that the inlet to a bypass flow passage is lower than a bottom of the inlet side communication hole, as required by claim 13.

Claim 14 specifies that the discharge hole is positioned lower than a lowermost position of reaction gas flow passages provided in electrode power-generating surfaces of the separators. The Examiner points out that the air outlet is set at the lowest portion of the fuel cell. However, Guthrie does not discuss the position of a discharge hole, as required by claim 14, which specifies that the discharge hole is located at the outlet of the bypass flow passage. The air outlet of Guthrie corresponds to the outlet side communication hole of the present invention and is not a discharge hole as required by claim 14.

The Examiner rejects claims 9-11 under 35 U.S.C. 102(a) as being anticipated by Wariishi et al. (JP 200149977). Applicants respectfully traverse the rejection.

The Wariishi reference is directed to a fuel cell stack comprising fuel cell units and first and second separators alternately stacked with each other. The second end plate 34 in Wariishi does not include a communication passage or a bypass flow passage, as required by the claimed invention. Rather, the second end plate in Wariishi includes a fluid outlet 112, which corresponds to the holes 94, 104 of the fuel cell of the present invention. The Wariishi reference also lacks a teaching or suggestion of a discharge hole 204, as required by claims 9-14.

In Wariishi, the hydrogen containing gas flows through the fuel gas supply passage 38, to the first flow passage 62, to the anode electrode 20, to the fuel gas discharge passage 44, and finally to the fuel gas outlet 56.

The air in the Wariishi device flows through the oxygen-containing gas supply passage 40, to the second flow passage 64, to the cathode electrode 22, to the oxygen-containing gas discharge passage 46, and finally to the oxygen-containing gas outlet 58.

The Wariishi reference does not teach or suggest a bypass passage for the hydrogen-containing gas from the supply passage 38 to the discharge passage 44, as required by the claimed invention. The Wariishi reference does not teach or suggest any bypass passage for the oxygen-containing gas from the supply passage 40 to the discharge passage 46, as required by the claimed invention. Rather, the hydrogen-containing gas in Wariishi flows from the supply passage 38 through the first passage 62 along the anode 20, and flows into the discharge passage 44. The oxygen-containing gas in Wariishi flows from the supply passage 40 through the second passage 64 along the cathode 22 and flows into the discharge passage 46.

The cited prior art does not teach or suggest a horizontally stacked fuel cell stack comprising an inlet communication hole penetrating the separators of the fuel cell units,

an outlet side communication hole and a discharge hole provided at a deep portion of the outlet side communication hole for supplying the reaction gas, as required by the claimed invention. Therefore, Applicants submit that claims 9-14 are allowable over the prior art.

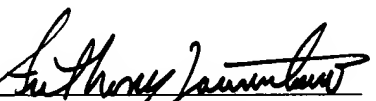
Conclusion

For the foregoing reasons, Applicants contend that pending claims 9-14 distinguish patentably over the prior art and that the claims are clear and definite. As such, the Applicants respectfully request that the Examiner's rejections so far as they are based upon 35 U.S.C. §112 and 35 U.S.C. §102 be reconsidered and withdrawn.

If there are any remaining issues, an opportunity for an interview is requested prior to the issuance of another Office Action. If the above amendments are not deemed to place this case in condition for allowance, the Examiner is urged to call the Applicants' representative at the telephone number listed below.

Respectfully submitted,

LAHIVE & COCKFIELD, LLP

By 
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Date: **February 24, 2003**

VERSION WITH MARKINGS TO SHOW CHANGES MADE

In the claims:

Please amend claim 9 as follows:

9. (AMENDED) A fuel cell stack comprising a fuel cell unit composed of a solid polymer ion exchange membrane interposed between an anode electrode and a cathode electrode, and separators for supporting said fuel cell unit interposed therebetween, said fuel cell units and said separators being stacked in a horizontal direction, said fuel cell stack including:

an inlet side communication hole which is provided to penetrate through said separators, for supplying a reaction gas containing a fuel gas or an oxygen-containing gas;

an outlet side communication hole for discharging a reacted gas corresponding to said reaction gas; and

a discharge hole which is provided at a deep portion of at least one of the outlet side communication holes opposite [as view from] a discharge port, [for at least one of said outlet side communication holes,] for supplying said reaction gas.